USEPA Comments on draft list of topics to address Tetra Tech concerns

December 5, 2016

Note: This version redacts enforcement confidential material

The Navy has proposed to hire a third party consultant to draft a technical memorandum to outline future Navy work needed to address concerns regarding the integrity of Tetra Tech's radiological cleanup work at the Hunters Point Naval Shipyard. On September 13, 2016, the Navy sent EPA a list of allegations from a former Tetra Tech employee regarding his observations of Tetra Tech past actions to under-represent the actual contamination levels at the Shipyard. Below are EPA comments on the Navy's proposed topics to include in the upcoming Navy evaluation. Working together with both the Navy's Radiological Affairs Support Office (RASO) and Base Realignment and Closure (BRAC) offices through regular conference calls with EPA and DTSC will facilitate an efficient and technically sound process. Sufficient resources should be committed to enable a thorough and timely resolution of outstanding issues identified. The comments below are organized into three parts:

A. **Response to Navy's list of allegations:** The first four comments are organized in order of the Navy's original list of issues.

B. **EPA's additional proposed topics for evaluation:** Next, these comments add several other areas that reflect EPA's independent research and analysis of readily available information or concerns that EPA has heard from members of the public. EPA recommends investigation into these areas both to fully evaluate any potential health concerns first and to improve public understanding.

C. **Context, communication, and credibility:** Finally, EPA recommends that a future public document provide context such as multiple lines of evidence regarding potential health risk and Navy work already done to resample anomalous soil samples in trench excavations and to rescan buildings. The contractor should also provide services to support communication to the public and stakeholders about their concerns and uphold the highest standards of ethical conduct to ensure credibility.

These comments reflect EPA's Superfund program's knowledge to date of allegations from former workers regarding Tetra Tech's work and preliminary screening of radiological data. As new information comes to our attention and as we conduct further evaluation, we will provide additional input. Where there are gaps in information or where it might be useful to get questions answered, please consider interviewing previous employees of Tetra Tech, particularly those who have come forward to speak about the allegations. Given that some EPA comments are based on information related to ongoing investigations, this version of comments redacts those sections that must be protected as enforcement confidential.

A. Responses to Navy's list of allegations

Notes: The Navy's original proposal language appears in *italics* below, followed by EPA's comments on each item. Where the original text from the Navy included names of individuals, this write-up removes names to respect privacy.

Sept 13, 2016 – Outstanding RAD Anomalous Soil Sample Questions

Specific incidents that need to be addressed.

1. *Observation of [redacted]*

EPA Comment: This allegation appears to potentially imply that contamination could have been left behind above release criteria after removals of storm drain and sanitary sewer lines and after several additional excavations after removals.

Given the uncertainty about what areas this alleged data manipulation could have affected, EPA recommends using a health-risk based approach to evaluate areas of potential concern. Priority areas of concern should include, but not be limited to, locations with greatest potential contamination based on historical records of activities, areas of greatest potential current or future exposure based on land uses, and areas of greatest health risk based on sampling results already collected. The Navy could also identify areas where several excavations have already occurred that fit the pattern described by a former Tetra Tech worker of occasions when Tetra Tech may have falsified data. Multiple lines of evidence should be presented.

As one potential line of evidence, the usual conceptual model for potential contamination from storm drain and sanitary sewer lines would suggest that concentrations of radionuclides would generally decrease with increasing distance from the original storm drain or sanitary sewer line location. One indication of location of greatest concern would therefore be locations of greatest risk based on radionuclide concentrations measured closest to the original line location. Based on these assumptions, as one of multiple potential approaches, EPA quickly performed a preliminary screen of the Navy's radiological sample results since 1999 from a spring, 2016, pull from the Naval Installation Restoration Information Solution (NIRIS) Database. EPA used the current version of EPA's Preliminary Remediation Goals for Radionuclides Calculator ("PRG Calculator") to estimate health risk.

Based on these health risk calculations, the greatest areas of concern appear to be from Ra-226 and Cs-137 within 2 feet of the soil surface. Attached are spreadsheets showing the Ra-226 and Cs-137 results, sorted by analyte value, for all samples collected within 2 feet of the soil surface. Where the depth field is left blank, the result is included for completeness. Below, for example, are some of the top values reported for Cs-137 in pCi/g:

Table 1

LOCATION_NAME	ANALYTE_VALUE	COLLECT_DATE	CONTR_NAME
707A1	80.4	7/14/1999	TETRA TECH EM, INC.
707A3	75.7	7/14/1999	TETRA TECH EM, INC.
707A1-A	17.8	7/14/1999	TETRA TECH EM, INC.
707A3-A	13.9	7/14/1999	TETRA TECH EM, INC.
707A1-D	2.12	7/14/1999	TETRA TECH EM, INC.
707A2	1.25	7/14/1999	TETRA TECH EM, INC.
707A1-C	1.04	7/14/1999	TETRA TECH EM, INC.
707A2-C	0.62	7/14/1999	TETRA TECH EM, INC.
707A2-G	0.45	7/14/1999	TETRA TECH EM, INC.

Below, for example, are results for some of the top values reported for Ra-226 in pCi/g:

Table 2

LOCATION_NAME	SITE_NAME	VALUE	COLLECT DATE	CONTR_NAME
03-PET-169-26	PARCEL UC3	4.1008	6/4/2010	TETRA TECH EC, INC.
6PBFS-050-383		3.7866	12/13/2008	TETRA TECH EC, INC.
70-PDT-077-152	PARCEL G	3.754	4/24/2008	TETRA TECH EC, INC.
70-PDT-084-193	PARCEL G	3.736	7/21/2008	TETRA TECH EC, INC.
6PBFS-051-298		3.645	1/9/2008	TETRA TECH EC, INC.
70-PGT-114-137	PARCEL G	3.6085	11/9/2009	TETRA TECH EC, INC.
70-PDT-076-71	PARCEL G	3.5144	5/3/2008	TETRA TECH EC, INC.
6PBFS-050-397		3.4509	2/12/2009	TETRA TECH EC, INC.
6PBFS-050-398		3.4423	2/12/2009	TETRA TECH EC, INC.
6PBFS-055-151		3.3699	12/17/2008	TETRA TECH EC, INC.
6PBFS-050-250		3.3685	11/14/2007	TETRA TECH EC, INC.
70-PDT-085-69	PARCEL G	3.3654	4/30/2008	TETRA TECH EC, INC.
6PBFS-055-109		3.3543	2/28/2008	TETRA TECH EC, INC.
6PBFS-050-374		3.3003	12/13/2008	TETRA TECH EC, INC.
6PBFS-050-25		3.2992	6/12/2007	TETRA TECH EC, INC.
6PBFS-050-163		3.2277	8/6/2007	TETRA TECH EC, INC.
6PBFS-050-30		3.2243	6/13/2007	TETRA TECH EC, INC.
03-PET-169-15	PARCEL UC3	3.103	6/4/2010	TETRA TECH EC, INC.
6PBFS-055-110		3.1027	2/28/2008	TETRA TECH EC, INC.
6PBFS-050-261		3.0792	11/14/2007	TETRA TECH EC, INC.

Potential risk from a combination of highest risk radionuclides should also be evaluated. EPA recommends researching the particular circumstances at the highest risk areas to evaluate the potential for health risk concern related to Tetra Tech allegations and then performing new, independent soil sampling to help clarify the actual risk. The above examples and other areas in the attached spreadsheets are potential areas for further inquiry. Any new sampling and analysis should be performed by an independent entity under regulatory oversight.

In addition, since excavations to separate storm drains and sanitary sewers or to repair drain or sewer lines could result in exceptions to the typical conceptual model because contaminated soils could have been replaced into separation or repair trenches at different depths, the potential that contamination could have been missed as a result of the Tetra Tech worker's allegations should be considered. For example, it may be possible to identify areas where storm drain/sanitary sewer separation occurred.

Another exception to the conceptual model is the area near Building 364 area, the site of both a Cs-137 spill and a liquid radioactive waste collection area. The Navy should give careful scrutiny to data from this location.

2. *Building 351A: [A former Tetra Tech worker] stated that while performing clearance sampling of the crawl space beneath Building 351A one of the samples returned from the lab indicating that there was contamination present beneath the building (he believed 4-5 pCi/g Ra-226). The sample data was discarded and replaced with clean sample results.*

EPA Comment: Samples should be collected in areas of concern following the Navy's sampling and analysis workplan required for determining compliance with the Record of Decision. Please discuss the workplan with regulatory agencies before proceeding with sampling. Please collect at least ten samples. Please inform regulatory agencies of the date and time for resampling so that regulatory staff may potentially conduct a site visit at that time to observe and potentially collect split or duplicate samples. Regulatory staff will follow health and safety instructions from the on-site health and safety officer regarding any restrictions on proximity to sampling and any other measures required to protect health and safety.

3. *Allegation redacted*

4. *Allegation redacted*

B. EPA's additional proposed topics for evaluation

In addition to the above list, the Navy's evaluation should also address these additional topics.

5. *Allegation redacted*

6. *Discrepancies in the Ra-226 decay chain:* EPA found in the NIRIS database that in Parcel B-2, Parcel G, and other areas, Tetra Tech reported in at least 2006, 2007, and 2008 some areas where concentrations of Pb-214 are shown to be higher than Ra-226. In some cases reported concentrations of Bi-214 are also higher than Ra-226. Because Pb-214 and Bi-214 are decay products of Ra-226, this result would not be expected. Many of these discrepancies occurred for samples analyzed by New World Technologies. Please address this finding. Table 3 on the next page shows some examples ranked in

order of Pb-214 concentration. In addition, EPA recommends that the Navy check for anomalies in the Thorium decay chain. Starting with the parent radionuclide Th-232, please compare concentrations of progeny radionuclides to screen for anomalous readings outside secular equilibrium.

Table 3

LOCATION_NAME	SITE_NAME	ANALYTE_NAME	ANALYTE VALUE	RESULT UNITS	COLLECT DATE
6PBFS-040-38		LEAD-214	16.515	PCI_G	2/23/2007
6PBFS-040-38		BISMUTH-214	0.40534	PCI_G	2/23/2007
6PBFS-040-38		RADIUM-226	0.18878	PCI_G	2/23/2007
6PBFS-039-20		LEAD-214	12.977	PCI_G	2/20/2007
6PBFS-039-20		BISMUTH-214	0.91336	PCI_G	2/20/2007
6PBFS-039-20		RADIUM-226	0.53066	PCI_G	2/20/2007
6PBFS-040-36		LEAD-214	11.63	PCI_G	2/26/2007
6PBFS-040-36		BISMUTH-214	0.28317	PCI_G	2/26/2007
6PBFS-040-36		RADIUM-226	-0.024999	PCI_G	2/26/2007
6PBFS-023-157		LEAD-214	11.107	PCI_G	2/16/2007
6PBFS-023-157		RADIUM-226	1.9986	PCI_G	2/16/2007
6PBFS-023-157		BISMUTH-214	0.68287	PCI_G	2/16/2007
6PBFS-045-01		LEAD-214	7.5547	PCI_G	4/18/2007
6PBFS-045-01		RADIUM-226	4.0861	PCI_G	4/18/2007
6PBFS-045-01		BISMUTH-214	1.8135	PCI_G	4/18/2007
6PBFS-045-06		LEAD-214	6.901	PCI_G	4/18/2007
6PBFS-045-06		RADIUM-226	2.7589	PCI_G	4/18/2007
6PBFS-045-06		BISMUTH-214	1.2625	PCI_G	4/18/2007
6PBFS-045-31		LEAD-214	6.4079	PCI_G	4/18/2007
6PBFS-045-31		RADIUM-226	1.7036	PCI_G	4/18/2007
6PBFS-045-31		BISMUTH-214	1.1064	PCI_G	4/18/2007
6PBFS-045-20		LEAD-214	5.8763	PCI_G	4/18/2007
6PBFS-045-20		RADIUM-226	3.2328	PCI_G	4/18/2007
6PBFS-045-20		BISMUTH-214	1.5348	PCI_G	4/18/2007
70-PDT-084-129	PARCEL G	RADIUM-226	5.816	PCI_G	4/10/2008
70-PDT-084-129	PARCEL G	LEAD-214	2.1694	PCI_G	4/10/2008
70-PDT-084-129	PARCEL G	BISMUTH-214	2.1246	PCI_G	4/10/2008
6PBFS-015-89		LEAD-214	5.6574	PCI_G	10/31/2006
6PBFS-015-89		RADIUM-226	1.7985	PCI_G	10/31/2006
6PBFS-015-89		BISMUTH-214	1.0552	PCI_G	10/31/2006
6PBFS-015-82		LEAD-214	5.5412	PCI_G	10/31/2006
6PBFS-015-82		RADIUM-226	1.9536	PCI_G	10/31/2006
6PBFS-015-82		BISMUTH-214	0.91255	PCI_G	10/31/2006
6PBFS-018-25		LEAD-214	5.5047	PCI_G	10/25/2006
6PBFS-018-25		RADIUM-226	2.5442	PCI_G	10/25/2006
6PBFS-018-25		BISMUTH-214	0.98923	PCI_G	10/25/2006
6PBFS-010-229		LEAD-214	5.4565	PCI_G	5/11/2007
6PBFS-010-229		RADIUM-226	1.9424	PCI_G	5/11/2007
6PBFS-010-229		BISMUTH-214	0.75724	PCI_G	5/11/2007
6PBFS-015-94		LEAD-214	5.3765	PCI_G	10/31/2006
6PBFS-015-94		RADIUM-226	1.9973	PCI_G	10/31/2006
6PBFS-015-94		BISMUTH-214	0.80636	PCI_G	10/31/2006

7. *Building scans:* Though the scan speed of buildings was originally outside the scope of this effort, for completeness, the Navy should at least provide a summary explanation of the issue that includes the following: 1) verifying what scan speeds were achieved for each of the buildings and whether documented radiation survey procedures were followed to ensure the Minimum Detectable Concentrations (MDCs) were met, 2) work Navy has already conducted to address the issue, and 3) any further work that will be necessary to ensure that the cleanup is protective. The Navy should also provide a discussion of potential public exposure and health risk related to this issue.

   The Navy should also address the elevated levels found in Buildings 271 and 406. It appears that levels found in Survey Unit 7 of Building 271 in the rescan should have been observed if prior scans had occurred at a speed of 8 approximately 8 cm/s or below. Previous scans appear to have been conducted at an average level of closer to approximately 2 to 3 cm/s. Details of these calculations appear in the attachment.-The Navy should address the implications of these findings for these and other buildings.

8. *Discarded potentially contaminated samples in open trenches:* The same former Tetra Tech worker mentioned above stated that his supervisors directed him to dump the discarded, potentially contaminated soil into trenches that have since been covered or paved. The recommendation for A.1 above could also address this concern. Please discuss and estimate the potential health risk due to this alleged practice to current and future residents and construction or other workers. Please use the current version of the EPA's PRG Calculator to estimate the potential health risk from this alleged practice. EPA is available to provide technical support regarding the use of the PRG Calculator.

9. *Allegation redacted*

10. *Previous anomalous soil samples investigation:* Please summarize work that has already been done from 2012 to 2014 when the Navy's RASO discovered anomalies in confirmation samples in trenches where sanitary sewer and storm drain lines were removed. In addition, [*allegation redacted]*

11. *Allegation redacted.*

C. Context, communication, and credibility

12. *Potential health risk to current and future residents and workers on or near the Shipyard:* Please provide multiple lines of evidence about potential health risk related to allegations regarding Tetra Tech misconduct. These could include the following:
    a. General discussion of historical potential sources of radiation, conceptual model for exposure to radionuclides, and likely associated health risks.
    b. Measurements during radiological cleanup work, e.g. dosimeter badges, hand scanning of workers and equipment at entry and exit, and air monitoring
    c. Weekly perimeter scans of the entire base
    d. Groundwater concentrations of radionuclides
    e. Results from portal monitors at the Shipyard and at receiving landfills
    f. Calculated risk estimates from modelling using different exposure scenarios for sensitivity analysis using the current version of the USEPA PRG Calculator
    g. Independent scanning or sampling by other agencies, including EPA and CDPH

    EPA can provide technical assistance about applying EPA's PRG Calculator and can provide documentation regarding EPA's independent evaluations.

13. *Communications:* Community members, press, elected officials, and other stakeholders have a high degree of interest in this topic. Please include in the contractor's scope of work development of a fact sheet and/or executive summary prepared in plain language accessible to a layperson audience. Also, prepare at least one presentation for one or more public meetings as needed.

14. *Staffing:* We have come to understand that the number of individuals who work on radiological clean-ups and are licensed as radiological technicians is relatively small in the United States, and that many of these individuals have long-standing personal and professional relationships with each other. To ensure the credibility and independence of the work of this technical memorandum, it is important that staff and managers involved in this effort do not include former employees of Tetra Tech (or close relatives of those employees) who could have been involved with previous work at the Shipyard.

15. *Prevention of future reoccurrence:* Please discuss additional oversight and/or assurance that is needed for EPA and the public to regain trust in cleanup work at the Shipyard. For example, please describe the scope of third party oversight activities.

16. *Previous anomalous soil samples investigation:* Please summarize work that has already been done from 2012 to 2014 when the Navy's RASO discovered anomalies in confirmation samples in trenches where sanitary sewer and storm drain lines were removed.

ATTACHMENT

A health physicist from EPA's contractor Techlaw, Inc., evaluated the Building 271 Survey Unit 7 data from the Final Status Survey Report and the rescan data provided in October 2016, from the Navy to estimate the average scan speed used in the previous work by Tetra Tech and the speed above which levels found in the rescan would have been missed.

Note that these estimates may not be based on the right input parameters, and the Navy has offered to provide factual information that may change the results.

Survey Unit 7 in Building 271 was used to perform calculations which indicate what the actual scan speed was. The target scan speed was 1.37 cm/second.

The detector used to scan for alpha/beta for Class 1 survey units on the floor was a gas proportional detector, Ludlum Model 43-37-1 with an active detector window size of 821 cm^2. From a review of the instrument specifications, the width of this detector is 15.9 cm in the direction of the scan, and 51.6 cm wide perpendicular to scan direction. Therefore, the width covered for each 'lane' of survey was approximately 51.6 cm.

From information provided in the Hunter's Point Final Status Survey Results, the Building 271 Survey Unit 7 (SU 7) included 71.90 m^2 and was investigated as a Class 1 Survey Unit, in accordance with guidance provided in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). SU 7 was divided into 1 large rectangle with dimensions of 10 m x 4.17 m = 40.17 m^2, and 2 smaller rectangles at 2 m x 4 m each, or a total of 4 m x 8 m = 32 m^2 to estimate the scan speed. Please note that this method provides an estimate only.

For the large rectangle, the room is 4.17m or 417 cm wide. The detector width is 51.6 cm, so 417/51.6 = 8. This would require scanning 8 lanes at 1000 cm in length each. This would total 8,000 cm of floor space to be scanned.

For the two smaller rectangles, area was assumed to be 2 m x 8 m each for a combined floor space equaling 32 m^2 or 3200 cm^2 of floor space to be scanned. The width of each rectangle equaled 2 m (200 cm) for a total combined width of 400 cm. 400cm/51.6 cm = approximately 8 lanes to be scanned at a length of 800 cm each. The total area to be scanned is calculated as 8 lanes x 800 cm = 6,400 cm of floor space.

8000 cm + 6,400 cm = 14,400 cm of space to be scanned in total.

Using scan data/information obtained from the Hunter's Point_Final Status Survey Result Building 271_03.23.2012, from pdf page 363 of scan survey information for Survey Unit 7, the entire survey was conducted in 98 minutes, or 5,880 seconds. If the surveys was conducted without any pauses or stops, this would equate to a scan speed of 14,400 cm/5,880 sec = approximately 2.4 cm/second.

In addition, we considered whether 496 measurements were sufficient to cover 71.90 square meters:

There are 719,000 cm^2 in survey unit 7 (71.90 m^2 x 10000 cm^2/ m^2)

For 496 measurements, divide the total area by 496 to see if the number of measurements are consistent with the size of the instrument. The result of this calculation is 1449 cm^2/measurement, which is larger than the instrument size of 821 cm^2).

To check this, divide 719000 cm^2 by 821 cm^2 to see if they collected enough measurements. If the instrument is 821 cm^2 875 measurements should have been collected to cover the entire survey unit, whereas there were only 496 measurements recorded for the Final Status Survey Results.

Both methods suggest that they did not collect a sufficient number of measurements because the scan speed was too high.

EPA's contractor health physicist would give more weight to the static measurements.

It is noted that the quality of the data could not be checked because daily and weekly source checks for determining the instrument background and efficiency were within tolerance limits was not provided. Therefore, evidence to support that the instruments were working properly was not available for review.

According to the Base-wide Plan Revision 1 (TtEC 2007), Scan speeds may be adjusted based, provided the probability of detecting contamination does not fall below 90%. This follows RASO guidance and we would agree with this assumption.

Given the assumption that the probability of detecting contamination for a given Ludlum 43-37-1 detector with a width of 15.9 cm, and a scan speed that must be achieved in order to obtain at least a 90% confidence, using the chart of probabilities included in the Addendum to Parcels B and G Radiological RACR on page 13 (Scan Speed vs probability), a scan speed of no faster than 8 cm/sec, with a scan time interval of 2 seconds would be needed to ensure the elevated areas of radioactivity are detected with a 90% confidence.